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INCORPORATED 1851

NOVEMBER, 1934

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THE NEW YORK ACADEMY OF MEDICINE

2 East 103 Street

New York, N. Y.

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EDITORIAL

HISTORY OF GASTRO-ENTEROLOGY

(With Special Reference to American Developments)[1]

From the time of Beaumont to the present, the physiology, pathology and surgery of the digestive tract have been not a little indebted to American enterprise and invention. In Germany, Kussmaul (1869), Leube, Ewald and Boas were the prime movers of recent developments. Boas was the first to specialize in gastro-intestinal disorders alone (1886), indeed started the first clinic and founded the first periodical (1896). The American Gastro-Enterological Association was founded in 1897, the German organization in 1914. Thus, a certain number of practitioners have been following gastro-enterology as a specialty for nearly half a century. Both Frerichs and Nothnagel stressed the backward condition of the subject in their time. Expansion was comparatively late, and mainly Germanic and American. This development had a long foreground and only the bare outlines of its history are known.

The interdictions put upon unsuitable, unclean or poisonous foods in the Mosaic code (Exodus, Leviticus) go back to the initial experiments of prehistoric man with regard to things edible or inedible. Everything was tried; much was learned from the avoidances of birds and animals; but

1. Read at the one hundredth meeting of the New York Gastro-Enterological Association, Union Club, October 11, 1934.

troglodyte experience was often like that ridiculed in the English witticism about fox-hunting: "the unspeakable in pursuit of the uneatable." In some such way, dietetics became the basic element in ancient therapy. In the Hippocratic tract on Ancient Medicine (430-420 B.C.), human concern about diet is associated with the dim and dubious origins of rational medicine itself. To the primitive Greek (say of Hesiod's time), poisonous plants and animals were already matters of avoidance (taboo). Wheat, barley, fruit, wine and olive oil were the main vegetable staples. Meat was more extensively consumed in the Homeric period than later; fish little, if at all. From his own uncomfortable sensations, the Greek rustic learned, by long experience of trial and error, to prefer cooked food to raw; to restrict diet to an irreducible minimum during acute illness; to ease the sick stomach with slop diet; to defer eating until the subsidence of a fever; to strike a sensible balance between gluttony and abstinence. Farmers and day laborers, used to one, at most, two meals a day, found themselves yawning, sleepy and stupified after the novelty of a mid-day meal; with the common experience of flatulence, colic and diarrhœa, if a dinner followed the lunch. In the hands of peripatetic physicians, such rude initial data became the starting point of a rational semeiology and dietetic therapy, as expounded in the classic utterance of Celsus: "In this way, medicine arose from the experience of the recovery of some, the death of others, differentiating the harmful from the salutary things." The inference that rational medical practice originated in some such way has a high degree of probability; in other words, gastro-enterology is probably the oldest phase of internal medicine, dissociated, at the start, from supernatural (speculative) causes. That the primitive harvest hands made good experimental animals is reflected in the verse of Horace:

> "Edit cicutis allium nocentius,
> O dura messorum ilia." (Epode III, 3-4)

In early Greek pathology, the very efforts of the body to bring the humors from a raw, fermented status (*apepsia*) to normal (*pepsis*) were associated with the idea of cookery

or coction, a view of digestive processes which survived until the 17th century. In the archæological remains of ancient Egypt, concern about food is already that of a well advanced civilization. We see the harvesting and marketing of fruit and grain; grape-arbors and fish-ponds; the kneading of dough; the brewing of beer; dining at table and the symbolic suckling of an infant at the udders of the cow Hathor. The Ebers Papyrus features intestinal parasites and the liver complaints common to all tropical and subtropical areas. In Assyro-Babylonian medicine, divination by inspection of the liver became an equivalent of prognosis. In the primer of Assyrian clinical medicine, which R. C. Thompson has pieced together from broken baked-clay tablets (1926)[2], there is already a respectable array of findings on diseases of the mouth alone. As assembled in the scholarly summary of Theodor Puschmann[3], the practical knowledge of digestive disorders, scattered through the literary remains of Greek medicine, was not inconsiderable. True, the clinical reasoning is clogged and obfuscated by the unbridled indulgence of the Greek physicians in speculating about the variable aspects of causation, by the general ignorance of human post-mortem appearances, by regrettable lack of the definite terminology necessary to classification, and by a pathetic groping toward clean-cut semeiology and therapy. Nevertheless, some of these clinical pictures of digestive disorders, embedded in the redundant expositions of Hippocrates, Celsus, Aretaeus, Galen and the Byzantine compilers, will be found to square with modern notions better than most.

The œsophagus, to begin with, while so denominated in Hippocrates, came to be envisaged as "the mouth of the stomach," the *cardia* of pre-Galenic writers. In Galen's time and thereafter, it was known as *stomachus*, both by the laity and the profession. By parity of reasoning, precordial distress (*morbus cardiacus*), while allocated to the heart by Erasistratus, Asclepiades and Aretaeus (*syncope*), was thought to be of gastric (eventually œsophageal) origin by Galen, Aetius and Alexander of Tralles. Caelius Aurelianus even differentiated a cardiac variety and a gastric variety, but the semeiology

2. Thompson: Assyrian Medical Texts. London 1926 (Englished in: *Proc. Roy Soc. Med.* (*Sect. Hist. Med.*), Lond., 1923-4, XVII, 1: 1925-6, XIX, 29.

3. Th. Puschmann: *Alexander von Tralles*, Wien, 1878, I, 204-259.

was necessarily obscure. Anorexia, excessive appetite (*bulimia*), excessive thirst (*polydipsia*), nausea and vomiting, sea-sickness and hiccough were all classified primarily as œsophageal disorders, yet recognized as symptomatic of gastritis and other digestive ailments. Diseases of the spleen and of the portal vein were long associated with the digestive system. Gastritis and hepatitis were recognized as such and handled at length, in separate chapters, by Aretaeus, Celsus and Alexander. Hepatitis might merge into jaundice, hepatic abscess or cirrhosis. The coeliac passion (*morbus coeliacus*) was a foul diarrhœa, associated with chill or atony of the stomach. Stools were sometimes examined in such conditions. The iliac passion (*ileus, volvulus, chordapsus*) was intestinal obstruction, often confused, for many centuries, with appendicitis. Diarrhœa, cholera, dysentery, ileus and painful stools (*tenesmus*) were allocated to the intestines. Colic was allocated to the colon. Intestinal ulcers were known. In the reading of Aretaeus, lientery (ridiculed in Molière) was a cachexia, usually associated with intestinal adhesions. Hippocrates and Aretaeus left masterly pictures of cholera, dysentery, jaundice and ileus. Alexander Trallianus notes three classes of intestinal parasites, viz., the thin, small worms causing anal pruritus (*Oxyuris vermicularis*); the round worms in the upper bowel (*Ascaris lumbricoides*); and the long flat worms, which often occupied the entire intestinal tract (*Taenia*). Pomegranate juice, male fern, castor oil, hellebore and thyme were employed as vermifuges. The test of expulsion that of the young lady in Charles Reade's novel: "I see the vermifuge has acted." In the Alexandrian period, Erasistratus had already devised a rude calorimeter.

For centuries, the theory and practice of digestion and its disorders was under the sway of the humoral pathology, in other words, virtually at a standstill. Beyond the dietetic precepts in the *Regimen* of the School of Salerno (1260), little was added to the practical knowledge accumulated by the Greek physicians. Associated with the four humors and the doctrine of planetary influences was the mediæval theory of the constitution, centering in the four temperaments, viz., the sanguine (Jovial), choleric (Martial), phlegmatic (Mercurial) and melancholic (Saturnine). The bilious or cholæmic diathesis, attributing jaundice to yellow bile and a dour disposition to black bile, became basic in Arabic and tropical pathology, even down to the days of the peppery nabobs of the Anglo-Indian service. How little was added to the anatomy of the digestive tract before Leonardo and Vesalius is suggested by the terminology employed by Shakespeare and his fellow dramatists. In

keeping with Greek and Roman usage, the stomach (*ventriculus*) was equated with the belly (*venter*), as in the parable about the belly and the members in Coriolanus (I, 1) or the episodes of Falstaff and Justice Greedy (Massinger). Up to very recent days, the "fair, round belly with good capon lined" was regarded as a natural attribute of the elderly, who now obliterate the semblance of a swallowed watermelon by dint of golfing and banting. As depicted by Athenaeus, the Elizabethans and later writers, the capacity of the ancients, the English, the Germans and the Russians for food and drink seems beyond human credibility. Gluttony was early ridiculed in the bursting belly of Philoxenus (Athenaeus, viii, 341), which was plagiarized by La Fontaine (*Le Glouton*) and later by Pope:

"The doctor call'd, declares all help too late:
Mercy, cries Helluo, mercy on my soul!
Is there no hope?—Alas!—then bring the jowl."

The drinking song in Gammer Gurton's Needle (1575) begins:

"I cannot eat but little meat
My stomach is not good,"

but a minute later, we have the reason, in the shape of a resounding chorus:

"Back and side go bare, go bare,
Both foot and hand go cold,
But belly, God send thee good ale enough,
Whether it be new or old."

There was manifest wisdom in the saw of the Persian poet Saadi that an empty belly connotes mental and spiritual activity or *vice versa;* whence the stomach, sometimes the whole gastrointestinal tract, became associated with pluck and courage ("guts"); fighting capacity with a full stomach ("Armies travel on their bellies") and the intestines, in particular, with compassion. Thus Wicliffe (1332) refers to the "bowels of Jhesu Christ," Sir Thomas Browne (1642) to "bowels of pity" (*Religio Medici*) and Jeremy Taylor to the "bowelless hangman" (1649). Even in Bulwer's Eugene Aram (1832), we read: I am a man that

can feel for his neighbors. I have bowels. I have bowels." The colon was sometimes equated with the stomach, e.g., "to feed colon" (Massinger, *Virgin Martyr,* III, 3) or Heywood's "What trick to satisfy colon?" The liver, for long regarded as the factory of the blood and one of the twin motors in the Galenic scheme of the circulation, was associated with courage, a touchy disposition and amorous propensities. Thus Hamlet (II, 2): "I am pigeon-livered and lack gall," or Chapman's "my venerean gentleman's hot liver" (*Widow's Tears,* 1612) or "I am all liver and turned lover," in an old play of 1606. The ancient fear attaching to a diseased liver in sacrifice and divination is reflected by Cassandra in *Troilus and Cressida* (V, 3):

> "Polluted offerings more abhorred
> Than spotted livers in the sacrifice."

Milton, Evelyn and Smollett describe a victim of congested liver as "liver-grown." Such expressions as "to stomach insults," "digest your angry choler" (*King Henry* VI, iv, 1), or to "digest the venom of your spleen" (*Julius Caesar,* IV, 3) are plainly survivals of an archaic physiology. In two places, Shakespeare maintains the old Galenic functional tripod of the heart, the liver and the brain (*Cymbeline,* V, 5; *Twelfth Night,* I, 1).

Up to the time of Beaumont, the physiology of gastric digestion was obfuscated by a series of dissolving views, summarized in William Hunter's epigram that the stomach was variously regarded as a mill, a fermenting wine-vat or a stew-pan.

To Galen, digestion was coction; in virtue of which, the stomach extracts what it needs from ingested food and passes on the rest to the intestines, the liver and other parts of the body *viâ* the blood channels. The mechanical view was advanced by Borelli and the Iatro-physicists, who limited gastric digestion to the grinding and crushing action of the musculature of the stomach. Baglivi even likened the teeth to scissors, the glands and viscera to sieves. The Iatrochemical theory of digestion as chemical fermentation was largely the work of Van Helmont, who maintained the old Galenic view that the products of digestion acquire natural spirits in the liver, which become vital spirits in the heart and animal spirits in the brain. Digestion is a continuous fermentative process in six stages. The acid, chyle-forming ferment in the stomach derives from the spleen. In the last stage, the tissues

and organs absorbing the blood charged with vital spirits are envisaged as "kitchens." The stomach itself is the seat of the soul, since a knock-out blow at the solar plexus may destroy consciousness. The pancreatic duct was discovered by Wirsung (1642), the submaxillary duct by Wharton (1655), the parotid duct by Stensen (1661). Sylvius, therefore, stressed the rôle of the saliva, regarded both gastric and pancreatic juices as acid and may be credited with some vague notion of acidosis. De Graaf obtained saliva, bile and pancreatic juice from the dog by canalising the parotid, biliary and pancreatic ducts (1664). His work seems prophetic of Beaumont, as Brunner's experimental excision of the pancreas (1683) seems prophetic of Banting. Réaumur obtained gastric juice from the stomach of kites and demonstrated its solvent action upon foods outside the body (1752). Spallanzani confirmed those findings but denied that the solvent principle is an acid (1782). Young of Maryland proved what Van Helmont and Sylvius had surmised, that the gastric juice contains an acid, turning litmus paper red (1803). This acid Prout showed to be HCl (1824). Through an accidental window in the stomach, Beaumont, a year later, was able to view and describe the processes of gastric digestion and gastritis *in situ* (1825), noted the inhibition of digestion by emotion, constructed a dietetic table from the digestibility of different foods and thus created the true physiology of gastric digestion (1833). Gmelin and Tiedemann discovered tryptophan (1826), which Claude Bernard subsequently proved to be a by-product of pancreatic digestion. The Gmelin test for bile (1826) had been anticipated by Marabelli (1788). Purkinje and Pappenheim noted the proteolytic power of the pancreatic juice (1836) and Lucien Corvisart that this solvent action is independent of acidity or alkalinity (1857-63). Claude Bernard revived the experimental pancreatic fistula of De Graaf and demonstrated the rôle of the gastric juice in emulsifying fats, changing starches into sugar and dissolving the proteins passed on to the intestines from the stomach (1849-56). The conversion of proteins into peptones within the stomach was first described by Meissner (1859-62). Ptyalin was discovered and isolated by Mialhe (1845), trypsin by Willy Kühne (1876), biliverdin by Berzelius (1840); bilirubin by Heintz (1851); urobilin by Max Jaffé (1859).

Magendie first described the mechanisms of vomiting (1813) and deglutition (1817) but missed their reflex character, which was later elucidated by Kronecker and Meltzer (1880-83). Beaumont's observations on the movements of the stomach were confirmed in an excised preparation by Hofmeister and Schütz (1886), but the real elucidation of this matter came from W. B. Cannon, who, at the instance of Bowditch, employed the x-rays (1896-1902). His findings are summarized in his book on The Mechanical Factors of Digestion (1911).

Cannon was the first to elucidate the mechanisms of gastrointestinal digestion with x-rays and the bismuth (eventually barium) meal. He

showed that the peristaltic wave travels continuously to the pylorus, with some slowing in the rate of conduction at the bridge, that the pylorus has an autonomy of its own in passing food on to the duodenum; that the pendulum movements of the small intestine (Ludwig, 1861) resolve themselves into rhythmic segmentations, to mix the content with the intestinal juices, culminating in a terminal peristaltic rush to the lower bowel; that the colon employs reverse peristalsis in the condensation of fæces and that the whole peristaltic process is affected by anæsthesia, surgical intervention, illness or other factors. Reverse peristalsis, contested by Mall, is a property of the entire gastrointestinal tract. In 1912-13, Roger Glenard illustrated intestinal peristalsis, particularly during purgation, by the cinematograph. Alvarez, by means of moving pictures of the exposed digestive tube, has elucidated Cannon's findings in great detail, particularly *re* the doctrine of gradients (1914-18). Carlson has investigated in detail the hunger contractions of Morat (1882) and Boldyreff (1904-14), showing functional activity even in the fasting stomach, which becomes very painful in the cases of gastric ulcers. The net result of these findings is to the effect that the gastrointestinal tract, like the heart, is an autonomic motor mechanism, which can function by the rhythmic, cell-to-cell transmission of impulse by the muscular tracts alone, even when excised from the body, and in which the nerve supply and intrinsic ganglia act as centralizers and coordinators in expediting conduction. Alvarez likens the coordinating nervous mechanism to a telegraphic or telephonic system attached to a railway or a factory, which can nevertheless run of themselves on occasion. The neurogenic theory of motor activity, which Magnus set out to prove in the intestinal musculature, has been completely supplanted by the myogenic.

Pavloff did for the secretory activities of digestion what Cannon did for the motor mechanisms of the gastro-intestinal tract. His work covers the whole broad field of the effect of emotion upon digestion, merging logically into the doctrine of conditional reflexes and behaviorism.

Psychic secretion of gastric juice had been noticed in a gastrostomized dog by Bidder and Schmidt (1852) and in man by Richet (1878). But by combining the improved Heidenhain fistula with an œsophagotomy, Pavloff and his pupils were able to cover all aspects of sham meals and psychic secretions. Secretin, the intestinal hormone which activates pancreatic secretion, was postulated by Bayless and Starling (1902); enterokinase by Pavloff (1899). The bile-forming function of the liver was known to the ancients. In the Galenic view, the undigested material carried from the stomach and the intestines to the liver by the gross blood in the portal vein was converted into pure blood by the separation of yellow bile (carried to the gall-bladder) and black bile passing to the spleen. The glycogenic function of the liver was discovered by Claude Bernard (1843-57). That the formation of bilirubin is associated with the disintegration of hæmatogen was known to Stadelmann (1890), Minkowski, Naunyn and others.

In 1913, Whipple demonstrated the possibility of extra-hepatic formation of bile by excluding the liver *viâ* an Eck fistula. Mann proved this conclusively by excision of the liver (1924-5), showing that bile can be formed by histiocytes in the spleen, bone-marrow and connective tissue. This, one of the greatest discoveries in the history of physiology, is associated with the functions of the reticulo-endothelial system and the subsequent discovery of the treatment of pernicious anæmia by raw liver (1925-6). The metabolic relations of the liver and the other digestive organs is matter of vast extent.

Up to the 19th century, little of consequence was added to the knowledge of digestive disorders outlined by the Greek physicians. The most suggestive approach, the pediatric, was totally neglected, although the prevention of gastrointestinal disturbances in infancy, by breast-feeding, selection of proper wet-nurses and milk-tests, was well developed among the Greeks and the ancient Hindus.

The meconium was voided by placing a little honey upon the lips of the new-born (the sugar diarrhœa of Orgler). This practice continued up to the Middle Ages, when a bit of sugar or sugared baked-apple was substituted. In the 17th century, Walter Harris, a pupil of Sydenham, adumbrated the doctrine of acidosis in infancy, which he treated by chalk and pearl juleps. Apart from gout and dysentery, Sydenham himself has little to say of digestive disorders in the adult. Jan Heurne, memorable for his association with the beginnings of bedside teaching, left a posthumous pamphlet on diseases of the stomach (1610); Ferriol, a little book (1668). Martin Harmes wrote on diseases of the stomach and intestines (1684). A favorite theme of the 17th century physicians was the dyspepsia from gastric atony implicit in the title *"De imbecilitate ventriculi."* This usage continued into the 18th century, when it was sometimes equated with the "hectic stomach" (Arnold, 1743) and later with the *embarras gastrique* of the French clinicians. Swalbe (1664) published a lengthy satire on "the quarrels and opprobria of the stomach" (*prosopopoia*). A more varied spirit of observation was manifested, here and there, by the 18th century physicians. In 1723, Boerhaave described a famous case of rupture of the œsophagus (autopsy on Baron Wassenaer, Pohl wrote on hardening of the stomach from abuse of alcohol (1771), Mertlick on intestinal sand (1786), Vanos (1704) and Lobé (1788) on diseases originating from gastric disorder. Congenital pyloric stenosis was described by Patrick Blair (1730), George Armstrong (1777) and, in America, by Hezekiah Beardsley (1788). Only two additional cases were recorded before 1888. Reil established the concept "polycholia" in 1782. Cowley had some notion of pancreatic diabetes in 1788. The literature on

dyspepsia is large. The old doctrine of acidity (*De humore acido a cibo orto*) is reflected in Joseph Black's dissertation on CO_2 (1754). Friedrich Hoffmann published a long series of tracts on gastric hæmorrhage (1679), saliva (1693-4) and its examination (1698), *Pumpernickel* (1695), apepsia (1696), diarrhœa in acute diseases (1700), gastritis (1706), diseases of the duodenum (1708) and the pancreas (1713), oatmeal cure (1714), iliac passion (1716), hepatitis (1721), diseases of the œsophagus (1722), cancer of the liver (1722), emesis (1725), pathology of liver diseases (1726), blood vomiting (1729), pharyngeal spasm (1733) and nausea (1733), which, if assembled, would make a very respectable manual of digestive disorders.

No such range of versatility in observation is apparent in any text-book between Hoffmann's period and that of Austin Flint (1868). The contents of early treatises on practice include no more than the diseases handled by the ancient writers, viz., dyspepsia, constipation, diarrhœa, colic, gastritis, enteritis, ileus, intestinal worms, jaundice, hepatitis and sometimes cancer of the stomach. A respectable fourth of Flint's Practice is taken up with digestive disorders and from this time on through the rest of the 19th century, there is farther expansion.

Among the earlier English books are those of Stone (1806), Marshall Hall (1820), Hare (1821) and Abercrombie (1828) on digestive disorders, Armstrong's pathological atlas of digestive diseases (1828), Rees on diseases of the stomach (1810), Howship on intestinal diseases (1820), Gibson (1801), William White (1808) and Faithorn (1814) on liver complaints. Later came George Budd's classics on diseases of the liver (1845) and stomach (1855), Brunton on diseases of the stomach (1859),which contains his account of plastic linitis, Frerichs (1858) and Murchison on liver diseases (1868). Contributions of enduring value were those of Laennec (1819), Hayem (1874) and Hanot (1876) on cirrhosis of the liver, Cruveilhier on the pathology of the peptic ulcer (1835), or Rokitansky's account of the pathology of acute yellow atrophy (1843) which Morgagni had described in 1762.

During 1867-9, Kussmaul began to employ the stomach tubes in the treatment of gastric dilatation and with this innovation, the modern development of gastro-enterology began. While stomach-pumps had been invented and employed by Alexander Monro (1767), John Hunter (1790) and Physick (1812) in the treatment of poisoning, this was a new departure. In 1871, Leube began to use the stomach-pump for diagnostic purposes, to experiment with test-meals and to envisage the concept "nervous indigestion," which was developed by Rejchmann (1883). Oser intro-

duced the flexible tube, which Ewald put into practice in 1875, combining aspiration of the gastric contents, with Boas' device of expression. Ewald and Boas then made test-meals viable. Ewald's Clinic of Digestive Disorders was published in 1879-88. Boas opened the first clinic (1886), began to lecture in the subject and published his text-book on diseases of the stomach in 1890-93. According to Bassler, he devised the resorcinol test, postulated the Boas-Oppler bacillus and the lactic acid and the high frequency of bleeding (95 per cent) in gastric cancer and used the test-supper to estimate gastric motility. Nothnagel's classic on diseases of the intestines and the peritoneum was published in 1896. From this time on, progress was rapid.

Mikulicz introduced gastroscopy and œsophagoscopy (1881). Glénard introduced diagnostic improvements (1885) and described the visceral ptoses (1887). Hirschsprung described megacolon (1887) first noted by William Leavitt (Chicago) in 1867. Bard and Pic described primitive cancer of the pancreas (1888) and Fitz hæmorrhagic pancreatic necrosis (1889). Sahli is memorable for advances in diagnosis. Knowledge of jaundice and its modalities was forwarded by Weil (1888), Stadelmann (1891), Chauffard (1907), Widal (1907), McNee (1913-14), Inada and Ito (1916) and others; diseases of the pancreas and pancreatic diabetes by Mering and Minkowski (1889-93), Opie (1901-3); Ssoboleff (1902), Cammidge (1904); MacCallum (1909), Banting and Best (1924); biliary calculus by Naunyn (1892) and Aschoff (1909). The Plaut-Vincent angina (trench-mouth) was established in 1894-6.

Much light was shed by visceral surgery, which Naunyn described as an "autopsy *in vivo*."

Intestinal anastomosis, first attempted by the Salernitan surgeons, was brought to a high point of perfection by Abbe, Dean, Murphy, Halsted and Carrel. Billroth covered most of the alimentary tract through his resections of the œsophagus (1872), the pylorus (1881) and the intestines (1878-83). His pupil, Wölfler, introduced gastro-enterostomy (1881). In 1897, complete excisions of the stomach were done by Schlatter and by Baldy (United States). Lane's operation for intestinal stasis came in 1903. Marion Sims (1878) and Langenbuch (1882) excised the gall-bladder. Maydl introduced colostomy (1888) and Kraske resection of the rectum (1892). Appendicitis, known to the mediæval surgeons as *passio iliaca*, was early noted by Fernel, Heister and others; first operated by Mestivier (1759); accurately described by Fitz (1886) and standardized as to diagnosis and operative procedure by McBurney (1889). Subsequent operating on the gastro-intestinal tract by the Mayos, Weir, Deaver, Sands, Finney and other recent American surgeons

has been brilliant. From the time of De Graaf, the physiology of digestion has been materially forwarded by surgical intervention on animals. Success in this field was naturally hampered by ignorance of the comparative anatomy and physiology of animals in the earlier centuries. Laterly, such procedures as Sander's device of exposing the intestines under salt solution for study of peristalsis (1871), the Eck fistula (1877), Pavloff's flap modification of the Heidenhain gastric fistula (1880) with intact nerve-supply (1900) or Mann's exclusion of the liver by excision (1921-5) have become essential and indispensible.

Röntgenography of the digestive tract owes much to the fluorescent screen and the Coolidge tube.

Holzknecht, Handek and Groedel made the first worthwhile serial x-ray pictures of the stomach in man (1909-12). A. F. Hurst advanced the radiography of constipation and defæcation (1908). Graham and Cole made x-ray study of the gall-bladder possible (1923-4). The sphincter of the common bile-duct (Oddi,1887) was discovered by Simon P. Gage (1879). Non-surgical aspiration of the gall-bladder, for diagnostic and therapeutic purposes, was introduced by Meltzer (1917) and Lyon (1919). Recent American work, at the Mayo Clinic and elsewhere, includes the investigations of Eggleston and Hatcher on the action of emetics and the mechanism of vomiting (1912-15), Case on intestinal stasis (1914-15), Alvarez on the mechanics of digestion and its clinical applications (1914-27), Ivy on gastric secretion (1920-25), Boyden, Mann and Higgins on the mechanism of evacuation of the gall-bladder (1924-6); Einhorn introduced gastro-diaphany (1887), stomach and duodenal buckets (1890-1908) and duodenal intubation (1909). Fractional intubation of the stomach was introduced by Rehfuss (1914); functional pancreatic tests by Boas, Cammidge (1912), Einhorn, McClure and Bassler; hepatic tests by Ehrlich (1886-1900), Van den Bergh (1918) and others. Dietetic schemes for gastric ulcer were started by Leube (1897) and improved by Lenhartz (1904), Lambert (1908) and Sippy (1915). The bacteriology of the intestinal canal is associated with the names of Eberth, Escherich, Alexander Schmidt, Herter, Shiga, Flexner, Chalmers and Bassler.

The first independent periodical on digestive disorders was the *Archiv für Verdauungskrankheiten* (1895-6), founded and edited by Boas. Two years later, the American Gastro-Enterological Association was organized (1897), largely through the efforts of Aaron of Detroit. In 1914, Bassler founded the first American periodical, the *American Journal of Gastro-Enterology*. A section of Gastro-Enterology and Proctology was established in the American Medical Association in 1917. The New York Gastro-Enterological Association was organized on April 30, 1915, the

National Society for the Advancement of Gastroenterology in 1934. In connection with these developments, chairs were established in the principal medical schools of New York for Einhorn, Nesbitt, Kemp, Bassler, Kantor, Andresen, Chace and other leaders; of whom Aaron (Detroit), White (Boston), Simon (New Orleans), Alvarez (Mayo Clinic), Smithies, Carlson and Portis (Chicago), Rehfuss and Lyon (Philadelphia, Harris (Birmingham), Gerry Morgan and Verbrycke (Washington) and Soper (St. Louis) have been outstanding elsewhere (Bassler). Col. Seale Harris was in charge of the Division of Gastro-Enterology of the Surgeon General's Office during the World War. More recently, the Medical Department of the U. S. Army has organized sections of gastro-enterology in all general hospitals. The principal American text-books have been those of Einhorn (1896-1905), Hemmeter (1896-1901), Kemp (1910), Bassler (1910-30), Aaron (1911-15), Lockwood (1913), Niles (1914), Stockton (1914), Lyon (1923), Hurst (1924), Kantor (1924), Crohn (1927), Rehfuss (1927), Kellogg (1931), Alvarez (1931), Morgan (1931) and Backstein (1932). As to disorders of infantile and adult metabolism, diseases of the blood and the nervous system, the dietetic treatment of all manner of clinical and surgical conditions, endocrinology and vitamin-therapy, the subject has immense ramifications, to which only passing reference can be made. In the light of these developments and of the work of Young, Beaumont, Fitz, Cannon, Mann, Whipple, Einhorn, Graham, Cole, Bassler, Alvarez and younger men, the record of American achievement in gastro-enterology seems far from contemptible.

During the long five-year famine, which followed the World War and the Russian Revolution, there was a gigantic turn-over of pathological conditions in Russia, which is of unique interest in connection with problems of food-economics, dietetics and gastro-enterology. Of old, the Russians were most liberal addicts of the pleasures of the table and, apart from communicable diseases, suffered mainly from disorders incident to repletion. There were

dinners in pre-war Leningrad which were voted the best in Europe. At the International Medical Congress in Moscow (1897), few American physicians were equal to the banquet in wait for them, after negotiating the very lavish *Sakouska* of *hors d'œuvres*. During the famine period (1919-23), this dietetic set-up was literally upset. The disorders due to repletion were displaced and supplanted by disorders incident to depletion. Constipation, obesity, gout, diabetes, alcoholism, appendicitis, gastritis and liver complaints disappeared and gave place to anæmia, peptic ulcers, visceral ptoses, noma, pyorrhœa alveolaris, flatulence, meteorism, acute enteritis, gastric cancer, neuropsychoses and neurasthenia merging into sexual impotence, with an appalling mortality from diseases of the heart and circulation. In the darkest period, cannibalism was not infrequent, and there are rumors of another immense wave of starvation in the Ukraine latterly. At intervals, similar conditions have confronted the famine-stricken populations of Ireland, India and Polynesia, of post-bellum Germany and Austria and those recently affected by the drought in our own Western areas. The famine-medals of the Middle Ages are tokens of distinct heuristic value. The immediate future of humanity will be largely bound up with economic problems, of which the relations of demand and supply in food-economics is one of the most outstanding. Facilities for transportation and administration, so essential to distribution of food-supplies of large cities and areas, have not been adequate to meet the problem of food-shortage. How intimately the medical profession is concerned with the economic problems of poverty, unemployment, food-shortage and starvation is suggested by the verse of Heine about the doctor whose sole prescription for an indigent patient was nourishing food and drink. From this point, our subject expands to the widest implications of the ancient saw, that man is and becomes what he eats (*Homo est quod est*).

It is probably from this association with the good things of life that gastro-enterologists, like the pediatrists, are a very genial set of men.

F. H. Garrison.

SEVENTH ANNUAL GRADUATE FORTNIGHT

"Diseases of the Gastrointestinal Tract"

October 22 to November 2, 1934

The Wesley M. Carpenter Lecture

THE APPLIED PHYSIOLOGY OF THE GASTRO-INTESTINAL INNERVATION*

Certain Selected Topics

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The subject of this lecture was chosen because of its general applicability to the topic under consideration during this fortnight of study. In view of the time allotted to the lecture the subject matter has been selected and will be presented in synoptic style. The topics selected pertain primarily to disturbances of motor activities, since disturbances of motility more frequently cause symptoms than disturbances of secretory activity.

All portions of the gastro-intestinal tract are intimately correlated by extrinsic and intrinsic nervous mechanisms and humoral agencies. Thus, in many diseases of the gastro-intestinal tract, we must think of the tract as a functional unit, and not solely of the viscus in which an organic lesion or disease is located.

First, I should like to discuss briefly the relation of the cerebral cortex to the autonomic control of the digestive tract. I am especially interested in this subject because of its highly probable relationship to the etiology of "peptic" ulcer. I have had sufficient contact with "peptic" ulcer patients to realize the rather important role played by sustained anxiety and the associated unhygienic eating habits in the genesis of ulcer.

* Delivered October 23, 1934.

One of the most interesting developments in modern physiology has been the demonstration by Pavlov that, as a result of a learning or conditioning process, a non-instinctive stimulus may excite or inhibit the gastric or salivary glands. The central nervous mechanisms which regulate the motility of the stomach may also be conditioned. For example, the pain caused by the insertion of a hypodermic needle will inhibit hunger contractions in the dog; but, after this is repeated a number of times, this pain no longer causes inhibition. However, if a new type of pain stimulus is applied, motility will be inhibited. In this instance, the dog has been conditioned to "ignore" the apprehension associated with the pain. He no longer fears that the pain may cause injury. After adequate training the dog can be subjected to a number of different types of mild pain stimuli, noises, etc., without inhibition of motility of the stomach. The dog no longer fears that he will be injured.

This raises the old question of whether the autonomic motor control of the digestive tract has representation in the cerebral cortex. Fulton and his associates[1] have recently reported that stimulation of the premotor area of the cortex in monkeys and chimpanzees results in vigorous movements of the intestine. They believe that this provides an explanation for the morbid hunger and intussusceptions which sometimes develop after bilateral extirpation of the premotor areas. The facts that on the one hand sleep and decerebration (King, in guinea pigs) augments motility and on the other hand dreams and apprehension usually inhibit motility[2], indicate that the primary influence of the cerebral cortex on motility is inhibitory in nature. The exaggerated motility on stimulation may indicate a release of lower autonomic centers from cortical inhibitory control, rather than direct stimulation. Nevertheless, the facts clearly indicate that cerebral activity may result either in an augmentation or an inhibition of gastrointestinal activity.

What are the observed effects of anxiety and emotion on the motor activity of the stomach? The inhibitory effect of

anxiety and anger was first directly observed in man by Beaumont. It was later studied in some detail in lower animals by Cannon[3] and Carlson[2].

As a general rule apprehension inhibits both the motility and secretion of the stomach. In lower animals no one, so far as I know, has seen any other effect. In man, radiologists[4] know that apprehension or mental shock causes the stomach to "drop" and become "flatter" in contour. I personally have seen the stomach of students drop in response to a threat and rise again and resume motility on provoking laughter by passing the threat off as a joke. Gastric emptying is definitely delayed by quizzing a poor student. It is not usually delayed by quizzing a good student who has faith and confidence in his ability to answer questions correctly. However, I am quite certain that occasionally strong emotion may cause spasm and hypermotility of the stomach without nausea and vomiting being experienced. The literature, in so far as actual evidence is concerned, is silent. Alvarez[5] has told me of two patients suffering from pain in the epigastrium following strong emotional stress in whom he made x-ray studies. In both instances he observed five or six deep waves passing over the stomach simultaneously, the stomach presenting the appearance of a sock filled with billiard balls. I have seen a similar picture in a hysterical young woman, in which detailed examination and other considerations revealed that the disturbance was not due to a viscero-visceral reflex or organic disease. Thus, it would appear that apprehension as a general rule leads to an inhibition of motility, but may in some subjects result in marked hypermotility and tonus of the stomach.

Todd[6] has made the most intensive study to date of the effect of anxiety on the human stomach. His subjects were medical students. He started his studies during the early apprehensive weeks of the "new life" of a modern medical student and continued with the same students for several years. He has reported that the "stable stomach"

does not respond readily to emotional factors and is found in persons with an "even temperament." Many of his first year students manifested an "unstable stomach" in that "dropping" and inhibition of movements of the stomach occurred when subjecting them to emotional factors. The stomachs of his second year students were more stable. Thus, as shown in the "pain" experiments on the dog cited above, through training or conditioning, the stomach may no longer be affected by inhibitory psychic factors. A more significant observation, however, was made, namely, that when the conditioned or trained stomach shows instability in response to more prolonged mental distress, the instability takes the form of hypermotility. Todd has stated: "hyperactivity of the stomach is always present in the anxiety complex and in patients consciously or subconsciously nervous but not afraid."

Over what nerves are the above effects transmitted to the stomach? Before this question can be clearly answered it is necessary to consider briefly the functional innervation of the stomach. Much of the recent work on this subject is confusing to the average reader. This is because of the actual complexity of the functional innervation of the stomach. For example, both motor and inhibitory effects may be obtained via either the splanchnics or vagi[7]. However, one must not permit details, although important, to fog a true conception of the predominating functional innervation of these nerves.

By sectioning the splanchnic nerves in dogs, it has been shown that psychic inhibition of gastric motility is almost entirely abolished[2]. This leads us to believe that the splanchnic nerves are primarily concerned in the psychic inhibition of gastric motility and tone.

But, the mechanism concerned in the production of the augmented motility that Todd reports as occurring in the unstable, conditioned stomach in the presence of sustained anxiety is not so clear. This is because such a condition has never been produced in lower animals in which the nerves may be experimentally sectioned. The vagi very probably

are primarily concerned, because of the following considerations. They are the predominant motor nerves of the stomach. Following section of the vagi in animals a permanent hypotonus and delay in evacuation of pastes and solids results[8], though liquids may soon be evacuated in normal time. Following section of the splanchnic nerves in man colic may occur which is relieved by atropine[9].

In spite of Crile's[10] interesting theories it is difficult to believe that this hypermotility and tonus is induced chiefly by the splanchnic nerves. However, it is true that spasm of the pyloric sphincter may be induced reflexly via the splanchnic nerves and that epinephrine in adequate dosage causes the sphincter to contract[11]. It is possible that given a contracted sphincter, the stomach will manifest compensatory vagal hypermotility. But, epinephrine inhibits gastric motility. (No one has studied the effect of psychic factors on the pyloric sphincter.) It is also pertinent that stimulation of the splanchnic causes vasoconstriction of the gastric vessels. This means that in anxiety some constriction of the gastric vessels may occur and cause some asphyxial spasm of the gastric musculature; but this could not continue for any length of time in the fundus of the stomach in view of the continuance of the normal or hypernormal secretion of the hypermotile stomach. It is difficult to picture how the peristalses in the pyloric antrum could continue, since a mild degree of anoxemia inhibits motility, although it does induce spasm of the sphincter[12]. Of course, it may be argued, in so far as the etiology of "peptic" ulcer is concerned, that the hypermotility of sustained anxiety is due chiefly to the vagus and that this is associated with an increased splanchnic vasoconstrictor tone of the vessels of the mucosa. Because so much of the foregoing type of speculation is required in any attempt to rationalize the procedure of adrenal denervation for "peptic" ulcer, it is difficult for a physiologist to warm-up to the idea.

I have yet to meet a clinician of extensive experience who denies that sustained anxiety is a factor in determining the chronicity and recurrence of "peptic" ulcer in many cases.

In this connection, Todd[6] reports that students may have hyperactive tracts for several years without developing ulcer, but hyperactivity was evident in those of his students who later developed the symptoms of ulcer.

We[13] have recently attempted to determine in the dog whether the maintenance of continuous hypermotility and hypersecretion of the stomach for a period of two months will result in chronic ulcer. One group of animals was injected every two hours with pilocarpine, a second group with histamine, and a third group with both pilocarpine and histamine. Acute lesions of the stomach and duodenum were observed only with pilocarpine, but no chronic or perforating ulcers were produced.

It would appear from these studies in the dog that some other factor besides hypermotility and secretion is necessary for the production of a chronic "peptic" ulcer. It should be remarked that these animals were fed a "smooth" diet, and the results might have been different on a "rough" diet. These drugs, of course, would not have a "neurotrophic" effect or a vasoconstrictor action which are the only other factors which have been suggested as being concerned in the "anxiety-ulcer" relationship. That a "rough" diet and hypermotility and secretion are factors conducive to ulcer is generally recognized and has much experimental support.

The major facts pertaining to the functional innervation of the pyloric sphincter may be briefly summarized as follows: the sphincter usually contracts on noxious stimulation of the gall bladder, colon and appendix[11, 14, 15]. The motor side of this reflex is primarily in the splanchnics. At the same time the stomach is inhibited unless nausea and vomiting occur in which instance the antrum contracts via the vagi. The vagi are concerned in the inhibition of both the sphincter and stomach when the duodenum is mildly stimulated (enterogastric reflex)[16]. This mechanism normally retards gastric evacuation. In the instance of irritation of the duodenum, the local Meissner-Auerbach's plexus

is concerned in causing contraction of the sphincter without inhibition of gastric motility[16]. This mechanism may be concerned in the delayed evacuation with hypermotility in cases of duodenal ulcer. Cases of duodenal ulcer that empty more rapidly than normal are to be explained by the more rapid rate of emptying of the duodenum, associated with the hypermotility of the stomach.

Reflex pylorospasm and vomiting occur in dogs with splanchnics sectioned.

In regard to the autonomic innervation of the biliary tract, I shall only point out that atropine favors the flow of bile from the common duct and pilocarpine has the opposite action. Atropine decreases the tone of the gall bladder but does not prevent the action of cholecystokinin. Pilocarpine causes some contraction of the gall bladder, but no bile is expelled into the intestine because of the simultaneous increase in the choledochus duodenal resistance[17].

Passing on to the intestine there is a point pertaining to appetite and intestinal obstruction which demonstrates a significant function of the autonomic innervation of the gastro-intestinal tract. In a study of continuous jejunal alimentation in two dogs, we observed that as long as we kept the intestine filled with food the dogs showed no desire to eat in the normal manner. However, after sectioning the vagi these animals manifested an inordinate appetite even to the extent of coprophagia. This shows that the feeling of satiety depends to a large extent on the vagus and that distension or irritation of the intestine, like the stomach decreases appetite. This was shown more strikingly by Herrin and Meek[18]. They continuously distended an isolated loop of intestine. A very copious secretion of intestinal fluid resulted, the dog would not eat and drink, became dehydrated, developed hypochloruria and died. However, after the nerves of the loop were sectioned, the dog would eat and drink and survived in spite of the continuous loss of fluids and chlorides. This demonstrated that the prime factor in the serious consequences of simple obstruction without strangulation is the loss of water and chlorides.

A consideration of the motor innervation of the ileo-cecal sphincter is of practical importance in that it may explain ileo-cecal intussusception that sometimes occurs in infants and after appendectomy in adults. The sympathetic supply of the ileo-cecal sphincter is definitely motor in its function. The vagi have both a motor and inhibitory effect on the sphincter, which, however, is slight when compared to the motor effect of the sympathetic[19]. If, during or following appendectomy the sympathetic supply to the sphincter and lower ileum is sectioned or affected, the sphincter will become patulous and the lower ileum hypermotile. This would increase the likelihood of the ileum undergoing intussusception into the cecum. Ileo-cecal intussusception is the most common type in the infant. According to Zamorani[20] the coeliac ganglion does not mature histologically until about two years of age. If this is true physiologically, we have the explanation for the clinically observed vagotonic tendency of the infant's gastro-intestinal tract. In addition the infant would have an atonic ileo-cecal sphincter which with a hypermotile ileum would predispose to ileo-cecal intussusception.

Our knowledge of the functional innervation of the colon of man is rather sketchy. We know much more concerning this subject in lower animals. Because of the rather marked anatomic differences some physiologists have hesitated to apply their work to man. However, this reticence is not entirely justified as has been demonstrated by the recent surgical treatment of Hirschsprung's disease. For years physiologists have known that the predominant parasympathetic effect was excitatory for the colon musculature and inhibitory for the sphincters, and that the predominant sympathetic effect was inhibitory for the colon and excitatory for the sphincters. It now appears to be established that section of the sympathetic supply of the colon in Hirschsprung's disease markedly alleviates the obstipation. The obvious result is relaxation of the smooth muscle sphincters of the colon and an increase in the propulsive activity of the colon.

Physiologically I believe the irritable or "unstable" colon is quite analagous to the "unstable" stomach which was discussed above. Clinically it is recognized that many "peptic" ulcer patients have an "unstable" colon. In both conditions belladonna, bland diet and sedation are used therapeutically. In regard to the "unstable" colon and cecal stasis a physiologic fact that is not fully appreciated is that the colon throughout its course manifests the phenomenon of receptive relaxation. This is true for the rectum as is well known. It is particularly true for the cecum. It is also true of the transverse and descending colon. The application of this fact, I believe, is obvious.

In certain abnormal conditions of the colon large quantities of mucus are produced. The evidence indicates that this is not due to a direct stimulation of secretion by nerves. However, prolonged stimulation of the pelvic nerves, repeated injection of pilocarpine, or the introduction of irritants into the colon increases the production of mucus. This would indicate that the augmented secretion is chiefly due to irritation of the mucosa and excessive motility. Extracts of the colonic mucosa according to Florey[21] do not increase mucus production.

It is of clinical interest that fear or apprehension causes pallor of the mucosa and of the colon, even in the absence of the adrenals[22]. If an area is inflamed, pallor does not result. This pallor is due both to a general contraction of the vessels of the mucosa and to a squeezing out of blood by contraction of the muscularis mucosae. The colon, on mechanical stimulation, shows a patchy pallor due to irregular contraction of the muscularis mucosae.

I next desire to discuss briefly some of the more important viscero-visceral reflexes. I shall not mention the important viscero-skeletal or viscero-somatic reflexes.

It has been well demonstrated that the sympathetics conduct sensory sensations responsible for the elicitation of visceral pain, muscular rigidity, cutaneous hyperesthesia and vasomotor disturbances[23, 24]. The vagi conduct sensa-

tions which elicit nausea and vomiting, affect appetite, and which in the case of the stomach mediate impulses that are responsible for satiety. The sensory pathway for crude heat and cold sensations from the stomach is not known. These nerves also mediate sensory impulses concerned in viscero-visceral reflexes. The pelvic nerves are mixed in regard to their sensory activity.

Gastro-ileo-colic and Duodeno-ileo-colic reflexes: When food is ingested a reflex is initiated from the stomach and especially from the duodenum which causes rather rapid evacuation of the distal ileum into the colon. This, in all probability, increases the activity of the colon. This in turn accounts for the early post cibum distress of the patient afflicted with a colitis.

The importance of this reflex did not impress me until several years ago when we made a study of the ileo-cecal sphincter. We observed that when some barium milk was placed into the distal ileum of a fasting dog through an ileostomy, it was retained there for one-half hour or longer. After the ingestion of food, the barium milk was evacuated into the cecum within fifteen minutes. The nervous mechanism of this reflex has not been determined.

Cholecysto-gastric reflexes: Recently Fishback and I studied[25, 2, 15] the effect of biliary tract distension and irritation on the movements of the stomach. We observed that mild stimulations inhibited gastric motility and decreased tone. This type of response, according to my views, is conducive to gastric flatulence and air swallowing. A sudden marked distension caused pylorospasm with nausea and vomiting. This accounts for the dyspeptic symptoms of gall bladder disease. But, the pain of biliary colic is not due to pylorospasm because the type of referred pain is different and biliary tract pain may be obtained in man and dog following subtotal gastrectomy[17].

Appendico-gastric reflex: The fact that the diseased appendix may reflexly affect the stomach is indirectly one of the reasons why the mortality of appendicitis is still so high in this country. The lay person thinks the symptoms are

due to a "stomach upset" and takes a physic or enema, which results in rupture and peritonitis. The physician, if called early, can save the life of practically every patient with appendicitis.

Experimentally distension of the appendix and cecum in the dog results in inhibition of the gastric movements chiefly via the splanchnic nerves[2] (also Bussabarger & Ivy). The pyloric sphincter generally contracts—an effect that is mediated chiefly via the splanchnics also. (Inhibition of the sphincter may also result)[2, 15]. Marked distension of the appendix and cecum particularly if the latter is irritated causes pylorospasm and frequently vomiting. Under such conditions it is difficult to determine whether the dog suffers epigastric pain or not. Dr. Livingston of New York has written me that when the appendix in man is distended, epigastric pain, nausea and sometimes vomiting result. Right lower quadrant pain, point tenderness and cutaneous hyperalgesia followed immediately. In this connection Loreti[26] has reported that after anesthetization of the right lower quadrant the pain in that segment disappears, but the epigastric pain persists.

Of course, epigastric pain does not always occur in appendicitis. Neither can the same type of viscero-visceral reflex always be elicited with the same stimulus in dogs. This must mean that either the reflex threshold is very high or other factors inhibit the reflex.

Smith[15] has found in patients that distension of a spastic colon may produce gastric spasm with severe epigastric pain, which is not elicited after atropine. This again indicates, as referred to above, that spasm of the pyloric antrum in contradistinction to the pyloric sphincter is due chiefly to the influence of the vagus.

It should also be borne in mind that irritation of the colon, cecum and appendix reflexly causes the ileo-cecal sphincter to contract. This has been demonstrated in animals[19] and ileal stasis has been observed in man by Hunt, Cole and Kantor[27].

Reflexes between the genito-urinary and gastro-intestinal tracts: Reflex changes in the stomach analogous to those described above may be elicited by stimulation of the genito-urinary organs[2, 28]. This should be borne in mind because patients have been treated for "dyspeptic" symptoms when the real source of their trouble was resident in the urinary tract.

Time does not permit me to proceed further. Such rather interesting and important gastro-intestinal viscero-visceral reflexes or effects as the colon-duodenal, viscero-cardiac[29, 30, 31] and reflexes within the colon itself [32] may be mentioned in passing.

Often when I contemplate the many mechanisms in the gastro-intestinal tract that may get out of order, and the fact that mental activity may throw some of them out of order, I think of the statement of Josh Billings, to wit, "I have finally kum tu the konklusion that a good reliable sett of bowels is worth more to a man than enny quantity of brains."

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28. King. Am. J. Physiol., 70:183, 1924.
29. Owen. Am. Heart J., 7:496, 1933.
30. Crittenden & Ivy. Am. Heart J., 8:507, 1933.
31. Hinrichsen & Ivy. Arch. Int. Med., 51:932, 1933.
32. Lawson. Am. J. Physiol., 109:257, 1934.

LIBRARY NOTES

EARLY LETTERS OF WILLIAM BEAUMONT NEVER BEFORE PUBLISHED

The one hundredth anniversary last year of the publication of William Beaumont's work on digestion brought into prominence the life of the military surgeon who had been neglected by posterity for many years. During the exhibit on that subject at the Academy in the fall, Dr. Irving Pardee was kind enough to present to the Library a letter written by Beaumont and a miniature of him as a young man, both of which had come down in the Beaumont family to Miss Lotta E. Hale of Hartford, Connecticut, great-great-niece of William Beaumont. We were also fortunate in the loan of four Beaumont letters by Mr. Hugh McLellan of Champlain, N. Y., who has given us his permission to publish them.

All four of these notes were addressed to Pliny Moore, Esq. of Champlain, distinguished judge of Clinton County for seventeen years. He was a descendant of a Deacon John Moor who left Dorchester, England, in 1635 and settled in this country. As a young man, Judge Moore enlisted in the American army, and in 1777 went to Canada with Benedict Arnold. He was later commissioned lieutenant by Gov. Clinton and served until the end of the war. At the close of the war he bought a large tract of land in Champlain and became an influential, highly respected figure. Beaumont's first three letters to him bear the dates November 2, 1807, 23 March, 1808 and 5 February, 1809. During the years 1807 to 1810 Beaumont taught school in Champlain and tended store. These two activities did not hinder him from other interests, as in 1807 he was serving as secretary "Pro tempore" of the Champlain Select Debating Society. He writes to Moore, "I have the pleasure to inform you that you are elected an honorary member of this society by the unanimous voice of the society and agreeable to our laws. Your attendance is solicited, and will be amicably accepted, on the evenings of Tuesday, in each & every week,

at six o'clock P. M., at Tyler & Beaumont's store. By order of the President's request of the Secretary and permission of the Society." The note of 23 March, 1808 is reproduced here. It is interesting to see his flourishing penmanship, possibly the result of his year as a schoolmaster.

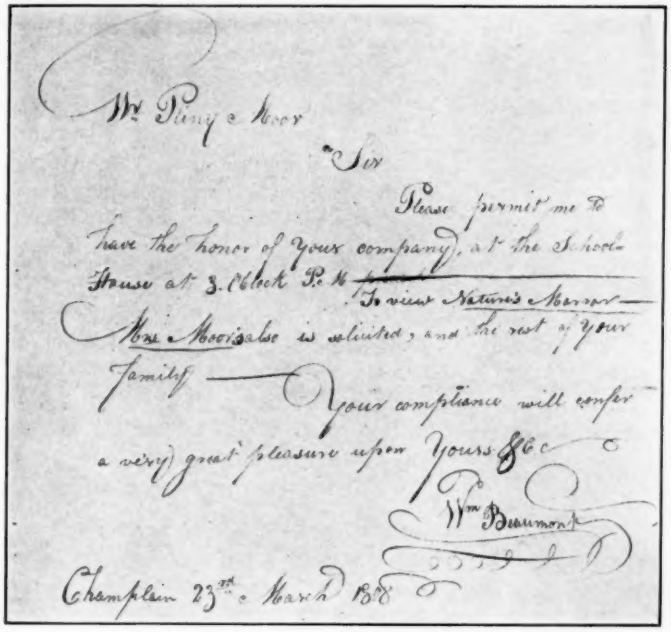
The letter written in 1809 indicates that Beaumont's early as well as his later years were troubled by controversy. "Honored sir: Not having an opportunity of tracing to the origin the crime which you partially alleg'd against me Saturday last, I am prompted by a sense of truth, honor, humanity, & justice to myself, to solicit a farther investigation of the subject, as I feel as tho' there were an injury done someone by such an attrocious, ungrateful & inhuman idea, as that of abusing & beating a child to such an unmerciful degree as has been asserted—and, sir, I wish to have the truth known & the aggressor punished. I stand ready & am willing & free to have my conduct in general, & my treatment toward the school in general or any individual of it, thoroughly inspected & critically investigated—& if I be the person guilty of such an act of atrocity as alluded to above, I justly deserve to be banished from the school, driven from society & punished with eternal neglect. I hold myself amenable to truth & am ready to stand its test—but a sense of inocence & a peaceful quiet conscience avert the fear of shame or aprehension of guilt.

"But if such be the assertions it behoveth me to know the author or the instigator & give a chance to him or his advocates to make true or fals the report & if it come from a child old enough to know or judge between right and wrong, it ought not to escape with impunity, & sir, if you be the parent of the child who deals thus largely in unfounded & inhuman falshood, you alone are the proper person to correct or reform him. If you do it not, I wish you to relieve me & deliver the school from the dangers & disturbencies which will arise from such circumstances. I make no words untill further inquiry into the origin of the affair. But there is an attrocious absurdity in existance either the act alleged, or the report asserted, one of which

must be substantiated before your own mind, your family's or mine can be at ease or rest satisfied.

"Your condescension of letting me hear from you on the subject soon, will command that attention & respect which is due from youth to age, honor & respectibility." Since the town records and school records were destroyed by fire, it is impossible to learn the outcome of the case, unless yet undiscovered correspondence comes to light. As he taught school there for still another year, we can assume he was exonerated. No doubt his rhetorical style came from his experience with the Select Debating Society.

It may be of interest to note that these three early letters give the spelling "Moor." Judge Moore was the first to add the final "e" to the family name, and the letter Beaumont addresses to him in 1820 has the new spelling. The subject of the note which is here reproduced, Samuel Long, came from Danville, Vermont. He was a carder of wool in the employ of the Judge. In January, 1819, while passing through Lyndon, Vermont, his carriage was upset and his thigh broken in two places. The physicians who attended him succeeded only in torturing the patient and did not even discover the second break. In May Long returned to Champlain with one leg three inches shorter than the other. The next step was to bring suit against the two doctors who were responsible for the condition, Dr. Calvin Jewet of St. Johnsbury, Vermont, and a Dr. Fields of London. A letter from Long, dated Jan. 26, 1820, reads, "By the advise of Mr. Vanness, Wee have agreed to submit it to a rool of Cort. Wee have agreed on three men, doct. Beaumont of Plattsburgh & doct. Wood of Champlain are the two that I have chose & doct. Powel of this place [Burlington] is their man . . ." The case was not brought to trial until June, 1820, and by that time Beaumont was in Michigan. On March 18, 1820, he was commissioned Post Surgeon by President Monroe and ordered immediately to Mackinac. He left Plattsburgh on May 6 of that year and so was not on hand to testify at the trial.



Mr Pliny e Moor

Sir

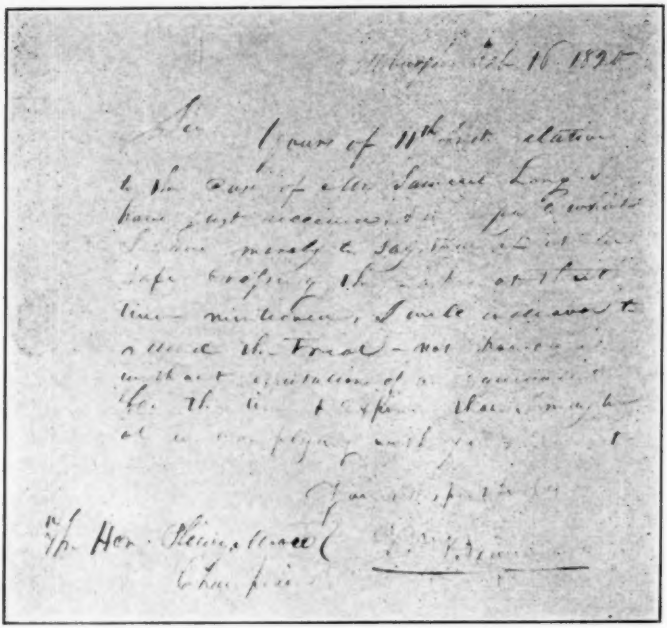
Please permit me to have the honor of your company, at the School House at 3. Oclock P. M. To view Natures Mirror— Your Phisicalse is solicited, and the rest of your Family— Your compliance will confer a very great pleasure upon Yours &c

Wm Beaumont

Champlain 23rd e March 88

Reproduced with the permission of the owner, Mr. Hugh McLellan of Champlain.

On May 30 of the same year, Beaumont wrote to his brother Abel from Niagara Falls, as he was en route to Mackinac. This letter is the gift of Dr. Pardee. "Having a minute or two liesure & knowing your wish to hear from me, I avail myself of the opportunity to say that I am well, & progress regularly on my rout—from Hartford, I proceeded to Albany & then directly on to Utica, when I took passage on the Great Western Canal in one of the boats, her first trip. I passed 82 miles to Montezuma in her. It is a most delightful way of travelling & goes at the rate of 5 miles an hour on perfectly smooth water—drawn by two elegant horses & you have all the accommodation of a steam boat without that confusion, or the least danger of accident. From there I proceeded to Buffalo in the stage—fell in company with the Rev. Doct. Morse—author of the Uni-



Reproduced with the permission of the owner,
Mr. Hugh McLellan of Champlain.

versal Geography & his son going on to Mackinac on a mission among the Indian tribes by order of the Government. He is a fine old gentleman & I probably shall have his company all the way, he being desirous that I should accompany him as far as I go on account of his health. Yesterday we came here to view the falls—that wonderful curiosity that he has very accurately described in his geography, though he had never seen them till now. He seem as much astonished at the view as though he had never heard of them, they so much surpass his expectations. You probably will see, e'er long, another great description of them. I believe he is making a new edition of his former geography from what I can collect from conversation. We go from here after we have crossed over the bridge to Goat Island & back & return to Buffalo & take the SteamBoat for Detroit, tomorrow morning.

"This must suffice for the rest of the family at present. Have the goodness to transmit it to them when you have perused it. Encourage John in his agricultural pursuits as much as you can. He will do well if he don't get discouraged. Look out for sharpers & take care of yourself. My respects to Mr. Francis & others, believe me, Your affectionate brother." A postscript reads, "Let me hear from you at Mackinac. I shall be there in a few days."

The "Dr. Morse" he mentions is Jedidiah Morse, born in Woodstock, Conn. in 1761 and died in New Haven in 1826. Although a clergyman, he is known now as the "Father of American Geography." He may also be remembered as the father of Samuel F. B. Morse, founder of the American system of electromagnetic telegraph. Another son, Richard Cory, 1795-1808, who made a name for himself as a journalist, was at one time a student of theology, and was probably the son referred to by Beaumont.

Further details of his trip are recorded in his diary, a large part of it having been published in Myer's *Life and Letters*. It is in such material that we get intimate glimpses into the lives and characters of great men whose memory should be honored and fostered.

GERTRUDE L. ANNAN.

RECENT ACCESSIONS TO THE LIBRARY AND MUSEUM OF THE NEW YORK ACADEMY OF MEDICINE

The Books and Instruments of John Greenwood

Often I am asked the question, "What is there so interesting that induces you to continue year after year as Librarian?" My answer usually is "The uncertainty, thrills and surprises that one receives."

One hopes that some day the long sought treasure he seeks will be uncovered and will come his way, and there is hardly a year when something worth while does not turn up. The past few months have amply rewarded the years of hope and search and The New York Academy of Medicine as well as the dental profession are thus the richer.

Through the generosity and kindness of the Misses Eliza and Mary Greenwood, the great granddaughters of John Greenwood, the latter's dental engine, instruments and dental books he possessed have been presented to the Academy. Besides these are several unpublished original manuscripts, written by John's son, Isaac John Greenwood. Truly, rich treasures have been added to the wonderful collection, and we hope that even greater ones will soon find their way to those now in the Academy's possession.

Horace Hayden, in one of his addresses* stated, while speaking of his entry into dentistry in 1792: "To this end he enquired of the elder Greenwood of New York for books on the subject of dental theory and practice. That gentleman informed him of the work of John Hunter which he procured . . ." This old copy, loaned to Hayden, of Hunter on the Teeth, dated 1778 (2nd edition) with marginal notes by John Greenwood, and its well-thumbed leaves, bears ample testimony to the careful attention with which the latter perused its pages.

John Greenwood, the second son of Mary I'ans and Isaac (1730-1803) Greenwood, the first native-born dentist, was born in Boston, May 17th in the year 1760 and died Nov. 16, 1819. He became the dentist to George Washington in 1789 and continued to serve him until the latter's death in 1799. It is doubtful if the dental profession has ever taken cognizance of the influence of the Greenwood family in early American dentistry, and to this day there are direct descendants in actual practice, perhaps the longest line of dental practitioners in existence.

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* *Amer. Jour. Dental Science*, 1839, *1*: 158-159.

Many of the observations that John Greenwood made and noted in this copy of Hunter, at the end of the eighteenth century, might today appear ridiculous. There are, however, some that sound familiar at this late date. The familiar phrase that a "clean tooth never decays" can readily be seen in the notes made by John Greenwood: "Cleanliness is a sure thing to preserve health." Though bacteriology was unknown, Greenwood recognized that there were tiny creatures that brought about the destruction of the teeth.

These creatures cannot live nor create except in filth and rottenness.

You will absolutely find that all the causes that have any tendency to destroy the teeth and gums in any shape or manner whatever, or giving pain, inflammation, etc., etc., in the mouth are occasioned by carelessness in not properly keeping them clean, but you will find a difficulty in convincing many ignorant people of it for they are so self-conceited that they think they cannot omit or do anything wrong, therefore, if they but partially clean their mouth they will insist to you that they have always cleaned their mouths with care.

The following advice to his patients might well be heeded in this day:

Whenever you perform any operation on the teeth, mind and do it effectually, and at the same time observe to the patient that all you can do is to put your teeth in a state of preservation, for them to take care of them, and be sure and give them the best advice how to do it, if they do not follow your advice it will be their fault and they will naturally find it out and come to you again, if they follow your advice and keep their teeth in good order then they will certainly recommend others to be benefited by you. On the contrary, if you do not give them good advice,—you lose your name and —practice.

There are some twenty-three observations recorded in this work.

Another important manuscript is the unpublished English translation of C. F. Delabarre's work in French, printed in 1820, one of the important dental books of the period. The translation of "A Review of the Mechanical Part of Surgeon Dentistry" was made, in 1828, by Isaac John Greenwood (1795-1865).

In the series of books issued in the American Journal and Library of Dental Science, 1845, there appeared the translation of another of Delabarre's work on "Second Dentition," 1819, by Chapin A. Harris.

Greenwood, in the same year, wrote a work of 227 pages, which was entitled "Treatise Upon Dentition and the Manner of Cleansing, Scraping, Filing, Plugging and Extracting the Human Teeth" and illustrated by the author. This unpublished manuscript, we hope, will now be printed. Besides the above-mentioned accession, there is the professional card, containing the likeness of John Greenwood, made by Roy in Paris in 1806.

Priceless as are the books, more so are the instruments and engine. The dental instruments were made by John Greenwood and used by him and his son. The top row are the operative, while the lower are those used in constructing the ivory artificial dentures. Several of the ivory handles of the operative instruments have carved upon them "Do not touch." Even John Greenwood considered them of great value, and so they have been preserved all these years.

The foot engine, perhaps the first so constructed, as at that time only the bow drill was used, was made from a spinning wheel and antedates Wilkerson's and Black's by some eighty years. Accompanying the wheel is the following note:

This is the spinning-wheel of Elizabeth Weaver, wife of Doctor John Greenwood, dentist of New York.

It belonged to her grandmother, Elizabeth Hoogland who married Joris Cosaart of New York and Somerset Co., N. J. Their daughter, Jane Cosaart married William Weaver of New York, whose daughter Elizabeth married John Greenwood, 22 March 1788. The spinning-wheel must be almost two hundred years old.

In the *Dental Cosmos* of October 1906 an article by Edward C. Kirk, D.D.S., *Original Communications*, gives the following: "A letter from his (John Greenwood's) son, Dr. Isaac J. Greenwood to Jonathan Taft in November 1860 gives many interesting details of the methods of practice pursued by his father. . . In the same letter he states—'my father was the first to use the foot drill, and he made it himself from an old spinning-wheel of my grandmother's, and since his death I myself used it—the same one—altogether in my practice for twenty years, and have it yet.' This device would seem to have been the direct American ancestor of the dental engine."

Dr. Isaac J. Greenwood whose letter is here quoted died May 14, 1865. The spinning-wheel came to me from his eldest son, my father, Isaac J. Greenwood, 2d, who died 16 December 1911.

(Signed) Eliza R. Greenwood.

BERNARD WOLF WEINBERGER.

RECENT ACCESSIONS

Brouardel, G. & Arnaud, J. L'organisation antituberculeuse française.
Paris, Masson, 1934, 259 p.

Calvet, J. L'épiphyse.
Paris, Ballière, 1934, 148 p.

Cannon, A. & Hayes, E.D.T. The principles and practice of neurology.
London, Heinemann, 1934, 333 p.

Chapin, C. V. Papers . . . a review of public health realities.
N. Y., Commonwealth Fund, 1934, 244 p.

Davison, W. C. The compleat pediatrician.
Durham, Duke Univ. Press, 1934, 1957 paragraphs.

Dore, S. E. & Franklin, J. L. Diseases of the skin.
N. Y., Appleton-Century, 1934, 410 p.

Dublin, L. I. & Bunzell, B. To be or not to be; a study of suicide.
N. Y., Smith, 1933, 443 p.

Du Bois, A. H. Physiologie et physiopathologie du système réticuloendothélial.
Paris, Masson, 1934, 204 p.

Fasciculus Cestriensis in honour of Sir William Hodgson.
[London, Macclesfield], 1934, 287 p.

Goldsmith, M. L. Franz Anton Mesmer: the history of an idea.
London, Barker, [1934], 282 p.

Hardy, (Sir) W. B. To remind, a biological essay.
Balt., Williams, 1934, 45 p.

Internal medicine; its theory and practice. Edited by J. H. Musser. 2 ed.
Phil., Lea, 1934, 1288 p.

Maher, C. C. Electrocardiography.
Balt., Wood, 1934, 250 p.

More, L. T. Isaac Newton, a biography.
N. Y., Scribner, 1934, 675 p.

Panico, E. Biomicroscopia del margine palpebrale e della congiuntiva.
Napoli, Idelson, 1934, 103 p.

Ruggles, A. H. Mental health; past, present, and future.
Balt., Williams, 1934, 104 p.

Sabin, F. R. Franklin Paine Mall.
Balt., Hopkins, 1934, 342 p.

Tenenbaum, J. L. Races, nations and Jews.
N. Y., Bloch, 1934, 170 p.
von Verschuer, O. Erbpathologie.
Dresden, Steinkopff, 1934, 213 p.
Weiller, P. Les lavages de plèvre.
Paris, Masson, 1934, 129 p.
Wenckebach, K. F. Das Beriberi-Herz; Morphologie, Klinik, Pathogenese.
Berlin, Springer, 1934, 106 p.
Wiggers, C. J. Physiology in health and disease.
Phil., Lea, 1934, 1156 p.

NINTH SERIES

OF

FRIDAY AFTERNOON LECTURES

TO BE HELD AT 4:30 O'CLOCK

THE NEW YORK ACADEMY OF MEDICINE
2 EAST 103 STREET

1934-1935

The profession generally is invited to attend.

1934

NOVEMBER 9

The recognition and treatment of peripheral circulatory failure (Shock).

Clinical differentiation between cardiac failure and peripheral circulatory failure—rôles of decreased circulating blood volume and increased capacity of the vascular bed—clinical pictures characterized by diminished venous return to the heart—the occurrence of peripheral circulatory failure: traumatic and postoperative shock, infections and intoxications, anaphylactic states, dehydration and hypochloremia, coronary thrombosis, diabetic coma, etc.—treatment of peripheral circulatory failure.

ARTHUR M. FISHBERG, *Associate in Medicine, The Mount Sinai Hospital.*

NOVEMBER 16

The therapeutic and toxic actions of some drugs recently introduced in the treatment of cardiac disorders.

A critical examination of the claims made for a number of drugs used in the treatment of heart disease will be made. The range of therapeutic dosage and the undesirable toxic actions will be discussed. Particular attention will be given to those drugs that affect the cardiac rate and rhythm, and to the so-called coronary vasodilators.

ARTHUR C. DeGRAFF, *Samuel A. Brown Professor of Therapeutics, University and Bellevue Hospital Medical College.*

NOVEMBER 23

Signs and symptoms in abdominal diagnosis. (Lantern Slides)

A. Analysis of the Clinical Syndrome.

(1) The basic nature of manifestations of abdominal disease; essential unity of clinical and laboratory data. (2) Different relative value of signs and symptoms in various intra-abdominal affections; examples, peptic ulcer vs. gastric cancer, acute appendicitis vs. ruptured corpus luteum cyst, mechanical intestinal obstruction vs. mesenteric thrombosis. (3) Classification of signs and symptoms; mechanical, humoral and neurogenic phenomena in practical diagnosis; illustrations, abdominal tumors, biliary tract diseases, cirrhosis of liver, intravisceral lesions vs. peritonitis. (4) Abdominal rigidity and cutaneous hyperalgesia; abdominal manifestations of extra-abdominal lesions. (5) The experimental approach to clinical problems; motion picture demonstration of ureteral and gastrointestinal visceral reflexes.

B. The Differentiation of Clinical Syndromes.

(1) Methods in differential diagnosis; merits of each; their relationship. (2) Multi-method approach to individual case study; a chart. (3) The fundamental law of differential diagnosis; specific applications.

EDWARD M. LIVINGSTON, *Associate Visiting Surgeon, Bellevue Hospital.*

DECEMBER 7

The interpretation of low back pain and its treatment. (Lantern slides)

I. A discussion of the predisposing factors in low back pain. a. Body form and muscular development. b. Anatomical variations. c. Occupational or sudden trauma. d. Unrecognized arthritis or other diseases.

II. Methods of examination helpful in establishing a correct diagnosis as to the precipitating cause and the exact location of the lesion which gives rise to the symptoms.

III. A discussion of treatment appropriate to the elimination of background and foreground causes and the relief of immediate discomfort by operative and non-operative methods.

ROBERT B. OSGOOD, *Emeritus Professor of Orthopaedic Surgery, Harvard Medical School.*

DECEMBER 14

The handicapped child.

A discussion of the more common ailments of childhood in their relation to physical and mental development. Attention will be called to physical and mental defects of ductless gland origin, to infections of the upper respiratory tract, gastrointestinal disorders and anomalies, postural errors, environmental conditions.

CHARLES G. KERLEY, *Consulting Pediatrician, Babies' Hospital.*

DECEMBER 21

The significance of excision in the treatment of local tuberculosis in bones, joints and lymph glands as exemplified in the treatment of tuberculosis of the thoracic wall.

The significance of local tuberculosis in bone, joints and lymph glands; phases of tubercular infection; relation of these lesions to lung tuberculosis; relation of bovine tuberculosis; aims of surgical treatment; relation of excision to arrest of local lesions and to local healing; relation of immobilization to local healing; danger of dissemination by excision; illustrative cases in tuberculosis of costal cartilages, ribs, mediastinal glands and clavicles.

WALTON MARTIN, *Professor of Clinical Surgery, College of Physicians and Surgeons.*

DECEMBER 28

Present status of the prostatic problem.

Recent investigation relative to the etiology of prostatic hypertrophy. Earliest symptoms of prostatic obstruction, importance of diagnosis of prostatic pathology. Modern methods of treatment.

HENRY G. BUGBEE, *Attending Urologist, St. Luke's Hospital.*

1935

JANUARY 4

The recognition of the early symptoms of brain tumors.

The significant clinical symptoms which may be indicative of a brain tumor in the early stages of its development; also cases in which there have been very few, if any, premonitory symptoms; cases where there has been unnecessary attention paid to sinus disease or to the gastro-intestinal tract where after there had been a careful examination and a proper consideration of all the clinical symptoms a brain tumor would have been diagnosed early instead of late in its course.

ISRAEL STRAUSS, *Attending Neurologist, The Mount Sinai Hospital.*

JANUARY 11

The diagnosis and treatment of meningitis.

A brief consideration of symptomatology and differential diagnosis of the various forms of purulent meningitis. Importance of the examination of the spinal fluid.

Discussion of types of meningococcic meningitis with reference to indications for treatment. When should serum be used intravenously? The routine use of serum intraspinally. Problems involved when the patient fails to respond to the routine treatment, with special reference to over-treatment and to the development of block.

Difficulties involved in the treatment of other forms of purulent meningitis. Comments on the best methods of treatment available at the present time.

JOSEPHINE B. NEAL, *In charge of the Division of Applied Therapy, Bureau of Laboratories, Health Department, New York City.*

JANUARY 18

Bulkley Lecture: *The relationship of trauma to malignancy.*

The rapid increase in the knowledge of the effective exciting causes of different malignant tumors calls for more rigid criteria by the medical profession, regarding the relation of trauma to cancer. One may no longer rely on the vague statement that we do not know the causes of cancer, and therefore, we may assume the importance of trauma whenever asserted. One must still proceed on the assumption that trauma may be capable of exciting a large variety of malignant tumors, but one must demand more rigidly than ever before, that the evidence favoring trauma is fully established, and that other better known causes are not present. This policy excludes any general statements regarding trauma and cancer, and demands that the evidence should be rigidly considered with each particular type. The lecture endeavors to present the present available data regarding the relation of trauma to some of the more important types of cancer.

JAMES EWING, *Director of the Memorial Hospital.*

JANUARY 25

Points in medical diagnosis.

Methods of diagnosis and differential diagnosis that a long experience has proven to be of value. Stress will be laid upon conditions in which laboratory methods are not of decisive aid. The affections touched upon will be mainly those of the chest and abdomen, in particular those of the diaphragm, gallbladder, pancreas, appendix, and kidney.

EMANUEL LIBMAN, *Consulting Physician, The Mount Sinai Hospital.*

FEBRUARY 1

Carditis in children.

Frequency of rheumatic carditis. Occurrence without other manifestations of rheumatic fever. Symptoms and signs of subacute and subclinical phases. Differential diagnosis. Public health aspects. Necessity for recognition of subclinical forms, and early diagnosis. Prognosis. Treatment. Methods for control.

LUCY PORTER SUTTON, *Assistant Professor of Pediatrics, University and Bellevue Hospital Medical College.*

FEBRUARY 8

Recent advances in cardiology.

A critical review of some of the more important contributions to cardiovascular physiology and disease in recent years. Recent contributions to medical and surgical therapy of vascular disease, anginal and congestive heart failure. Brief comment upon increasing knowledge of, and limitations of the electrocardiographic method.

H. M. MARVIN, *Associate Clinical Professor of Medicine, Yale University School of Medicine.*

FEBRUARY 15

Tumors of the breast.

All tumors of the breast are not cancerous but should be considered as such by the physician and the patient until definitely proven otherwise. The proportion of benign to malignant tumors in a large series of cases was given five to four. Treatment in any stage except early, is still unsatisfactory. In view of our present knowledge the only hope of lowering this high mortality is based upon a scientific suspicion of all breast tumors, their early and complete removal, radiation and a very careful "follow-up" of the individual.

ARTHUR M. WRIGHT, *Professor of Surgery, University and Bellevue Hospital Medical College.*

MARCH 1

Clinical aspects of nephritis and hypertension.

A pathogenetic classification. Clinical recognition of each type. A composite scheme for testing kidney function. Uremia. Prognosis. Treatment of cardiac and renal edema. An evaluation of drug therapy in essential hypertension.

WILLIAM GOLDRING, *Assistant Professor of Clinical Medicine, University and Bellevue Hospital Medical College.*

MARCH 8

The management of late syphilis. (Lantern Slides)

A lantern slide demonstration of late cutaneous syphilis, and syphilis of the bones, viscera, etc. A discussion of the importance, diagnosis and prognosis of late syphilis; latent syphilis; late congenital syphilis; general manifestations of cardiovascular, cerebrospinal and visceral syphilis. A description of relatively benign, dangerous and destructive lesions with symptomatology. Marriage and childbirth. Serology. Treatment—routine therapy outlined and modified according to age, duration, serology, past treatment, character of lesion, parts involved, latent or active, and other indications. Therapeutic indications and contraindications. Danger signs.

GEORGE MILLER MACKEE, *Professor of Dermatology and Syphilology, New York Post-Graduate Medical School.*

MARCH 15

Bronchoscopy, its value in the practice of medicine.

The value of bronchoscopy in conditions of the chest is given from the standpoint of its daily practical application. Its value in the clarification of obscure clinical symptoms, physical signs, or x-ray findings is stressed and examples of such experiences are demonstrated and cited.

MERVIN C. MYERSON, *Director of Otolaryngology, Kings County Hospital.*

MARCH 22

Leukemia—diagnosis and treatment.

Classification of various forms of leukemia from the aspect of clinical manifestations and hematological findings. Diagnosis. Treatment: The use of deep x-ray radiation, radium pack and arsenic in large doses will be considered in some detail.

JOSEPH E. CONNERY, *Associate Professor of Clinical Pathology, University and Bellevue Hospital Medical College.*

MARCH 29

Management and treatment of disorders of menstruation and the menopause.

A brief resumé of our present knowledge of the menstrual function. The various factors which may be involved in dysfunction. How these may be determined. Possibilities and limitations of treatment with special reference to the various endocrine preparations.

BENJAMIN P. WATSON, *Professor of Obstetrics and Gynecology, College of Physicians and Surgeons.*

APRIL 5

Sudden deaths with reference to their prevention. (Lantern Slides)

This paper deals mainly with autopsy findings in over 1,000 cases of sudden death from natural causes, and gives a summary of the lesions most commonly encountered in sudden, unexpected death.

Attention will be called to the very large number of deaths, chiefly in males, between the ages of 40 and 55. As 7 out of 10 of these deaths are due to organic heart disease, in which coronary arteriosclerosis and its sequellae play the most important rôle, the question arises: Are any of these deaths preventable? Their relation to over-eating, persistent driving of a tired body, over-play, hurry, anxiety, intense emotions such as anger, fright and worry, will be discussed.

Objection will be made to the popular belief that science can prolong the span of human life. It does, however, enable more people to live longer in the normal span. Men over 45 should endeavor to live their age and grow old gracefully.

HARRISON S. MARTLAND, *Chief Medical Examiner of Essex County, New Jersey.*

PROCEEDINGS OF ACADEMY MEETINGS

OCTOBER

STATED MEETINGS

The first Stated Meeting of the Academy for October, was omitted.

THE HARVEY SOCIETY (IN AFFILIATION WITH THE NEW YORK ACADEMY OF MEDICINE)
October 18

THE FIRST HARVEY LECTURE, "The Etiology of Pernicious and Related Macrocytic Anemias," Wm. Bosworth Castle, Associate Professor of Medicine, Harvard University Medical School.

This lecture takes the place of the second Stated Meeting of the Academy for October.

SECTION MEETINGS

SECTION OF DERMATOLOGY AND SYPHILOLOGY—October 2

I. PRESENTATION OF MISCELLANEOUS CASES FROM VARIOUS CLINICS.

II. DISCUSSION OF SELECTED CASES.

III. EXECUTIVE SESSION—Examination of cases is limited to members and their invited guests.

SECTION OF SURGERY—October 5

I. READING OF THE MINUTES.

II. PRESENTATION OF CASES—a. Demonstration of a fracture-orthopedic operating frame, Herbert Bergamini; b. Four cases of advanced carcinoma treated by electro-surgical methods, Tibor de Cholnoky; c. Six cases of inoperable malignant tumor six years after treatment with electro-surgery, George A. Wyeth; d. Three cases illustrating first paper of the evening, Frank L. Meleney; e. A case of gelatinous carcinoma of breast, C. W. Cutler, Jr.

III. PAPERS OF THE EVENING—a. The use of zinc peroxide in anaerobic and microaerophilic infections, Frank L. Meleney; b. Gelatinous carcinoma of the breast, George T. Pack.

IV. GENERAL DISCUSSION—Allen O. Whipple, Frank E. Adair.

SECTION OF NEUROLOGY AND PSYCHIATRY—October 9

I. PAPERS OF THE EVENING—*Acute Anterior Poliomyelitis*—a. Pathogenesis, Maurice Brody (by invitation), Arthur R. Elvidge, McGill University (by invitation); b. Immunization, William H. Park; c. Abortive cases as protective agents against epidemics, John R. Paul, Yale University School of Medicine (by invitation), James D. Trask, Yale University School of Medicine (by invitation); d. An experimental approach to the problem of resistance, C. W. Jungeblut.

II. DISCUSSION—John L. Rice, Josephine Neal, Frederick Tilney, Bernard Sachs, George Draper.

SECTION OF OPHTHALMOLOGY—October 15

I. INSTRUCTION HOUR, 7 to 8 o'clock—Diagnosis of muscle anomalies, James White, John Dunnington.

II. DEMONSTRATION HOUR, 7:30 to 8:30 o'clock—a. Slit lamp studies, Milton Berliner, Isadore Goldstein, W. L. Hughes, Girolamo Bonaccolto; b. Case examinations.

III. SECTION MEETING, 8:30 to 10:30 o'clock—a. Reading of the minutes; b. Case reports: 1. A case of unilateral exophthalmos produced by a meningioma in the middle cranial fossa, Martin Cohen, John E. Scarff (by invitation); 2. a. Case of fasciola hepatica with ovae in the vitreous; b. Metastasis in the choroid from carcinoma of the testis, Isadore Goldstein, David Wexler; c. Moving pictures, Charles N. Spratt, Minneapolis (by invitation); 1st reel: Euncleation with fat implantation, Removal of steel from anterior chamber, Removal of soft cataract by suction, Insertion of tube for lacrimal stenosis; 2nd reel: Glaucoma, sclerecto-irido-dialysis; 3rd reel: Cataract extraction—pocket flap method; 4th reel: Pocket flap cataract.

SECTION OF MEDICINE—October 16

I. READING OF THE MINUTES.

II. PAPERS OF THE EVENING—a. Artificial pneumothorax in the treatment of lobar pneumonia, W. E. Robertson, Philadelphia (by invitation); b. Pneumonias due to Pneumococcus Type XIV (Cooper): Occurrence, characteristics and serum treatment, Jesse G. M. Bullowa.

III. DISCUSSION—Edgar Mayer (by invitation), William H. Park.

SECTION OF GENITO-URINARY SURGERY—October 17

I. READING OF THE MINUTES.

II. PAPERS OF THE EVENING—a. Tolerance, maintenance and protective dosage in urinary infection. Lantern Slides, Victor C. Pedersen, Discussion opened by Oswald S. Lowsley, Anthony Bassler; b. Urinary calculi. A clinical and experimental study, Lindwood D. Keyser, Roanoke, Virginia (by invitation), Discussion opened by Nathaniel P. Rathbun, Alexander R. Stevens, George F. Cahill.

SECTION OF OTOLARYNGOLOGY—October 17

I. READING OF THE MINUTES.

II. DEMONSTRATION OF THE WORK OF THE NEW YORK LEAGUE FOR THE HARD OF HEARING (in patient's room beginning at seven o'clock).

III. PAPERS OF THE EVENING (8:30 o'clock)—a. The medical aspects of hearing conservation in New York City schools, Edmund P. Fowler, G. B. McAuliffe, Discussion by E. B. Faulkner; b. The physiological effects of physical therapeutics in otolaryngology, Richard Kovacs; c. A critical analysis of the methods of physical therapy in rhinolaryngology, Lee M. Hurd; d. A critical analysis of the methods of physical therapy in otology, A. L. Hollender, Chicago (by invitation), Discussion of the papers of Drs. Kovacs, Hurd and Hollender opened by Henry Hall Forbes and Harmon Smith.

SECTION OF ORTHOPEDIC SURGERY—October 19

I. READING OF THE MINUTES.

II. INTRODUCTION TO THE TREATMENT OF SCOLIOSIS AT THE NEW YORK ORTHOPEDIC DISPENSARY AND HOSPITAL, Benjamin P. Farrell.

III. PRESENTATION OF PATIENTS ILLUSTRATIVE OF THE TREATMENT OF SCOLIOSIS, Henry F. Ullrich (by invitation).

IV. PAPERS OF THE EVENING—1. Preliminary treatment of scoliosis, Henry F. Ullrich; 2. Interpretation of roentgenograms, a. Measurement of angles, b. Determination of the primary curve, Albert B. Ferguson (by invitation); 3. Correction of the curve by plaster jacket, Henry F. Ullrich; 4. Determination of the correct area for fusion operation, Albert B. Ferguson; 5. The fusion operation, after-care and results, Henry F. Ullrich.

V. GENERAL DISCUSSION—Samuel Kleinberg, Philip D. Wilson (by invitation), Joseph E. Milgram (by invitation).

SECTION OF PEDIATRICS

The October meeting of the Section of Pediatrics will be held on October 19th and 20th at the Hotel Ambassador in connection with the American Academy of Pediatrics (Region 1) and the Tri-city Pediatric Society. Morning session 9:30 a.m. and afternoon session 2 p.m. As the meeting will be clinical no program will be published.

SECTION OF OBSTETRICS AND GYNECOLOGY—October 23

The Section has decided to forego its October meeting in favor of the Graduate Fortnight. The program of the Graduate Fortnight for Tuesday evening, October 23, has been arranged by courtesy of the Section.

AFFILIATED SOCIETIES

THE NEW YORK ROENTGEN SOCIETY (IN AFFILIATION WITH THE NEW YORK ACADEMY OF MEDICINE)—October 15

I. 8:00 to 8:30 p.m.—Demonstration and discussion of interesting cases.

II. 8:30 p.m.—Errors in cholecystography and their correction—Wm. H. Stewart, H. E. Illick.

III. DISCUSSION TO BE OPENED BY—Ross Golden, Charles Eastmond, S. Fineman, William Snow.

NEW YORK MEETING OF THE SOCIETY FOR EXPERIMENTAL BIOLOGY AND MEDICINE AT THE NEW YORK ACADEMY OF MEDICINE—October 17

I. Further experiments on effect of testicle extract on the agent of Chicken Tumor I—F. Duran-Reynals, A. Claude (Introduced by J. B. Murphy).

II. Protective substances in sera of animals injected with anterior pituitary-like hormone of teratoma testis urine—G. H. Twombly, R. S. Ferguson (Introduced by J. Ewing).

III. Successive transmission of virus of lymphogranuloma inguinale through white mice—A. W. Grace (Introduced by P. Reznikoff).

IV. Effect of Antuitrin S on circulating blood—S. H. Geist, F. Spielman.

V. Renal excretion of inulin, creatinine and xylose in normal dogs—A. N. Richards, B. B. Westfall, P. A. Bott.

VI. Inactivation and regeneration of glycolytic enzyme of muscle extract—L. Michaelis, J. Runnstrom.

VII. Epinephrine and blood sugar level—M. C. Hrubetz (Introduced by H. B. Williams).

VIII. Treatment of adult scurvy with crystalline Vitamin C. (ascorbic acid)—I. S. Wright (Introduced by W. J. Stainsby).

IX. Ovarian irradiation and sexual precocity in rat—J. Mandel, E. N. Grisewood (Introduced by H. O. Haterius).

THE OPENING OF THE SEVENTH ANNUAL GRADUATE FORTNIGHT THE NEW YORK ACADEMY OF MEDICINE

BERNARD SACHS
President

As President of The New York Academy of Medicine, let me extend a hearty welcome to all those who intend to participate in this Seventh Annual Graduate Fortnight.

The New York Academy of Medicine has, ever since its organization, been eager not only to promote the welfare of its members, but also to be a distinct factor in the community for the advancement of medical science. It knows no better way of doing this than to give a very large number of men, actively engaged in medical practice, the opportunity, within the brief period of two weeks, to become acquainted with the progress made in definite fields of medical science.

During the past years, we have considered a number of very important subjects; to mention only a few, disorders of the circulation, functional and nervous problems in medicine and surgery, tumors, disorders of metabolism. Each subject seems to have met with general approval, and this year, the special committee in charge of the present Annual Graduate Fortnight, has chosen the subject of the diseases of the gastrointestinal tract. The large attendance in former years, and the promise of an equally large one this year, are an endorsement, if such is needed for the project in hand.

Special acknowledgment and special thanks are due to the members of the Committee of which Dr. Frederic W. Bancroft is Chairman, who have given unstintedly of their time to the preparation of the programs, to the selection of authoritative speakers in connection with every subdivision of the subject, and who have made every effort to have the hospitals and clinics of this City take a very active and important part in the clinical and research aspects of the

entire subject. If we have not prepared a feast of reason, we have at least prepared one that will be certain to satisfy and stimulate your scientific curiosity.

Aside from the benefit which those will derive, who are taking this Graduate Fortnight seriously, I hold it to be one of the chief advantages of the Graduate Fortnight that it serves to bring together men in various special lines of scientific endeavor, and that it tends, as I intimated last year, to prevent further decentralization of our science. The human body is a unit, and medicine must remain a unit, however much we may be inclined to pay special attention to numerous details.

As I scan the program, as it has been arranged, the internist, the pediatrist, the gastroenterologist, the surgeon, will be equally attracted by the discussion of the subjects that are to be submitted for your consideration. While I would particularly invite you to these evening meetings, and to encourage your attendance at these meetings, I hope that the majority of you will be able, in the afternoons, to visit many of our hospitals, and to realize the enormous amount of good work that is being done throughout the City.

While New York is often accused of advertising itself a little too conspicuously, I feel that in matters medical and surgical, New York has been unduly modest, and that some of our colleagues beyond the metropolitan area do not fully realize the importance and the excellence of the work done here day by day.

Let me urge you also, while you are in the City, to become thoroughly acquainted with the purely scientific centers of research and the opportunities that are afforded in the various public institutions for many who have special problems in mind that they wish to solve.

I venture to say that anyone having such problems in mind, with limited opportunity for study and research in his own community, will find help in this town for any problem that he wishes seriously to pursue.

I have also this further suggestion to make, and that is, that those of you who have any spare hours at any time of the day, especially during the mornings, make liberal use of the library of this Academy. You will be welcome and you will find it an excellent place for study and reflection.

I presume it is well for me to state that besides being the President of the Academy, I have been, these many years, an active Neurologist. I have a special interest, therefore, in one of the subjects, and if he does nothing else, I hope that the one speaker who is to discuss Functional and Nervous Diseases of the Stomach, will throw a little light on the supposed and much discussed nervous origin of peptic ulcer. I do not wish to prejudice the case, but I have found it rather difficult to accept some of the extreme views that have been promulgated on this subject, especially from the Middle West. However, I will bow to superior knowledge wherever it may come from.

Please regard these opening remarks as a mere appetizer. The substantial meal will be spread before you by others specially authorized to speak.

DEATH OF HONORARY FELLOW AND FELLOW OF THE ACADEMY

RAMON Y CAJAL, SANTIAGO, Madrid, Spain; elected an Honorary Fellow of the Academy February 4, 1904; died October 17, 1934. Santiago Ramon y Cajal won recognition as one of the world's greatest neurologists. He was founder of the Histological Institute in Madrid. In 1906 he received the Nobel Prize in Medicine and Physiology, the only Spaniard to receive this award in any field of science.

LUSK, WILLIAM CHITTENDEN, B.A., M.D., 47 East 34 Street, New York City; graduated in medicine from Bellevue Hospital Medical College, New York City, in 1893; elected a Fellow of the Academy January 6, 1898; died October 24, 1934. Dr. Lusk was a Fellow of the American College of Surgeons and the American Medical Association, and a member of the County and State Medical Societies, the New York Surgical Society, and the Society of Alumni of Bellevue Hospital. He was Consulting Surgeon to Bellevue and St. Vincent's Hospitals and was for some time Professor of Clinical Surgery in the University and Bellevue Hospital Medical College.